REMARKS/ARGUMENTS

Status of Claims

Claims 1-8 are pending in this application, with claim 1 being independent. Claims 1, 4, 7 and 8 have been amended.

Overview of the Office Action

Claims 4 and 7 have been rejected under 35 U.S.C. §101 as being directed to non-statutory subject matter.

Claims 1-8 have been rejected under 35 U.S.C. §103(a) as being obvious over U.S. 7,386,048 ("Sun").

Information Disclosure Statement

An Information Disclosure Statement (IDS) was filed with the present application on August 14, 2006, but the IDS has not been acknowledged in the Office Action. Applicants request that the Examiner acknowledge review of the cited references by providing an initialed copy of the Form 1449 which was filed with the IDS.

Rejections Under 35 U.S.C. §101

Claims 4 and 7 have both been amended to recite a "software module, stored on a non-transitory medium" in accordance with current USPTO practice relating to statutory subject matter. Withdrawal of these rejections is therefore requested.

Claim 8, although not rejected, recites a software module and therefore has been similarly amended.

Summary of Subject Matter Disclosed in the Specification

The following descriptive details are based on the specification. They are provided only for the convenience of the Examiner as part of the discussion presented herein, and are not intended to argue limitations which are unclaimed.

The disclosed embodiments relate to a method of determining a prediction direction in intraframe video coding, such as defined in the H.264/MPEG-4 AVC standard. (Pub. app. at ¶1). Video coding an image generally includes performing compression, with the aim of reducing the quantity of data to be transmitted over telecommunications networks, while attempting to obtain a final reproduced image of the best possible quality. (Pub. app. at ¶¶2-3).

Interframe image coding involves establishing the difference between a current image and an image predicted from preceding images. Only the difference is transmitted, which represents a high level of compression since the quantity of data to be transmitted is considerably reduced. In intraframe coding, on the other hand, the video image is coded with respect to itself, without reference to or comparison with other images, such as preceding images. (Pub. app. at ¶¶4-5).

Conventional intraframe block coding relies on prediction relative to adjacent picture elements (pixels). The prediction of a block leads to the construction of a "virtual block" for the current block, comparing the virtual block with the current block determines the difference between the virtual block and the current block, and the difference is transmitted over the network accompanied by additional data enabling the block to be reconstituted from this difference. Appropriate processing by the receiver reconstitutes the video image by applying the difference transmitted to the virtual block reconstructed by means of this additional data. (Pub. app. at ¶7).

To improve intraframe coding, prediction directions are defined which are used to interpolate the pixels of an adjacent block to predict the current block, i.e., to construct a virtual block associated with each prediction direction, and the virtual block that compares best with the current block determines the difference to be transmitted over the network. In other words, each prediction direction is associated with a different processing algorithm yielding a different virtual block. There are therefore as many virtual blocks for the same current block as there are prediction directions. Of course, the prediction direction chosen is that which achieves the best quality/compression trade-off. (Pub. app. at ¶8.)

A conventional method of enabling the coder to decide on the best prediction direction systematically calculates all the virtual blocks for all possible prediction directions and then compares all these virtual blocks with the current block to determine the direction that gives the smallest difference between the associated virtual block and the current block. However, because of its complexity, entailing calculating all the necessary interpolations for calculating all the virtual blocks, this method proves very costly in terms of computation time. (Pub. app. at ¶¶9-10).

Accordingly, the disclosed embodiments seek to determine the prediction direction of a current image block that reduces the calculation time needed to find the best prediction direction, i.e., the prediction direction that yields the virtual block closest to the current block. (Pub. app. at ¶11). This is done using an iterative algorithm, as shown in Fig. 4 and described at paragraphs 32-44 of the published application. The algorithm involves evalutating two main prediction directions (S and E) and then proceeding to evaluate other directions in a specific sequence determined by the iterative process.

Descriptive Summary of the Prior Art

Sun relates to intraframe prediction for video compression. Sun uses intraframe coding or intracoding to exploit spatial redundancies within a video image. According to Sun, because adjacent blocks generally have similar attributes, the efficiency of the coding process is improved by referencing the spatial correlation between adjacent blocks. This correlation may be exploited by prediction of a target block based on "prediction modes" used in adjacent blocks. (Sun at col. 2, lines 31-38).

Sun discloses that each pixel in a target block may be predicted with reference to data regarding pixels in adjacent blocks. This adjacent pixel data or adjacent block data comprises the "prediction modes" used to predict those adjacent blocks or adjacent pixels. (Sun at col. 2, lines 53-57). Prediction modes may comprise instructions or algorithms for predicting specific pixels in a target block. These modes may refer to one or more adjacent block pixels as described in the mode descriptions at cols. 3-4 of Sun. (Sun at col. 3, lines 1-4). Each prediction mode may be described graphically by an angular direction. This angular direction may be expressed through a diagram with arrows radiating outward from a center point as depicted in FIG. 3 of Sun. (Sun at col. 4, lines 47-53).

According to Sun, prediction modes may be ordered in a manner generally consistent with their likelihood of producing a reduced prediction error. In such a case, the resulting compressed data itself may have a greater tendency to be more consistently ordered. Furthermore, communication of the prediction modes to the decoder (to allow decompression of the data) may take advantage of coding techniques that reduce memory and bandwidth requirements. (Sun at col. 5, lines 25-33).

Sun discloses that the nine possible prediction modes (or "directions") may be arranged in a number of different possible orders (see Sun at cols. 5-6). The particular order to be used may be based on factors such as whether the block borders discontinuities, such as image edges or swipe/swath boundaries. (Sun at col. 5, lines 33-63).

According to Sun, the estimation of the likelihood of the prediction modes may be based on the prediction modes used in adjacent blocks. The most likely prediction mode should be ordered first, the second most likely prediction mode ordered second, if desired, followed by the remaining modes in a predetermined manner. The predetermined manner should be independent of the prediction modes of adjoining macroblocks. Specifically, the preferred order of the remaining modes should be in a decreasing likelihood of occurrence of the remaining modes. (Sun at col. 7, lines 57-67).

Under this approach, the intraframe prediction mode order for block C may be based on the prediction modes used in adjacent blocks A and B. If neither block A nor block B is "outside" of the frame in question, then:

(i) if the prediction mode of block A is less than the prediction mode of block B, then the intra prediction mode order for block C is: {intra prediction block mode A, intra prediction block mode B, other modes in ascending order};

(ii) if the prediction mode of block A is greater than the prediction mode of block B, then the intra prediction mode order for block C is: {intra prediction block mode B, intra prediction block mode A, other modes in ascending order};

(iii) if the prediction mode of block A equals the prediction mode of block B, then the intra prediction mode order for block C is: {intra prediction block mode A, other modes in ascending order}. (Sun at col. 8, lines 1-34).

For example, if the prediction mode of block A is 3 and the prediction mode of block B is 1, then intra prediction mode order for block C is: {1, 3, 0, 2, 4, 5, 6, 7, 8}. With the modes arranged in a generally decreasing likelihood (or increasing) of occurrence, then the automatic arrangement of the remaining modes of occurrence will still be generally arranged in the proper sequence. The ordering of the sequence from higher to lower probability increases the likelihood of the proper prediction toward the front. According to Sun, with entropy encoding this arrangement decreases the resulting encoded bit stream. (Sun at col. 8, lines 35-45).

Patentability over the Prior Art

As discussed above, the embodiments disclosed in the present application are concerned with determining the best prediction direction for intraframe coding by using an iterative algorithm in which particular initial directions are evaluated for a particular block. Then, based on the results of these evaluations, further particular directions are evaluated until the best direction is determined for the block in question (see, e.g., Fig. 4 of the published application). This may make it possible to determine the best direction without actually calculating a virtual block for all of the possible directions.

Sun, on the other hand, is concerned with determining a prediction mode (or "direction") order, such that the one or two "most likely" prediction directions are presented at the beginning of the sequence, and the remaining directions are presented thereafter in a predetermined order. The most likely directions are determined based on the prediction direction used in adjacent blocks.

As acknowledged in the Office Action at pages 3-4, Sun does not disclose any of the elements of claim 1. However, the Examiner states the following: "In view of Sun's disclosure that the mode order may be reordered and the finite number of possible mode orders, one of ordinary skill in the art at the time of the invention could have pursued the known possible mode orders with

a reasonable expectation of successfully finding the optimal order for particular coding situations." Based on this, Applicants assume that the Examiner is applying Sun based on "obvious to try," which is one of the "Exemplary Rationales" for establishing *prima facie* obviousness in accordance with *KSR v. Teleflex*, as discussed in M.P.E.P. §2143. Under the "obvious to try" rationale, the Examiner must meet the following requirements:

> **E. "Obvious To Try" - Choosing From a Finite Number of Identified, Predictable Solutions, With a Reasonable Expectation of Success**
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> To reject a claim based on this rationale, Office personnel must resolve the *Graham* factual inquiries. Then, Office personnel must articulate the following:
>
> (1) a finding that at the time of the invention, there had been a recognized problem or need in the art, which may include a design need or market pressure to solve a problem;
>
> (2) a finding that there had been a finite number of identified, predictable potential solutions to the recognized need or problem;
>
> (3) a finding that one of ordinary skill in the art could have pursued the known potential solutions with a reasonable expectation of success; and
>
> (4) whatever additional findings based on the *Graham* factual inquiries may be necessary, in view of the facts of the case under consideration, to explain a conclusion of obviousness.

As explained below, there are at least two fundamental flaws in the manner in which this rationale has been applied in the Office Action. First, the Office Action fails to establish that there are a "finite number of identified, predictable potential solutions to the recognized need or problem". Second, in applying the *Graham* factors, the Examiner has failed to consider the claimed invention "as a whole", as the law requires, but rather, has improperly distilled the claimed invention down to its supposed "gist".

Finite Number of Potential Solutions

Regarding the required "finding that there had been a finite number of identified, predictable potential solutions to the recognized need or problem", the Office Action states:

> However, as discussed above regarding the disclosure of Sun, there are a finite number of prediction directions, and therefore a finite number of identified and predictable potential mode orders. In view of Sun's disclosure that the mode order may be reordered and the finite number of possible mode orders, one of ordinary skill in the art at the time of the invention could have pursued the known possible mode orders with a reasonable expectation of successfully finding the optimal order for particular coding situations. Therefore, the claimed subject matter would have been obvious to a person having ordinary skill in the art at the time the invention was made.

(Office Action at page 4). It appears from this statement that the Examiner considers "successfully finding the optimal order for particular coding situations" to be the solution to the recognized problem.

However, the Examiner appears to be confusing the result achieved by the solution, i.e., an optimum ordering of directions, with the solution itself, i.e., the method of obtaining the optimum ordering. The question to be answered is whether one of ordinary skill in the art would have successfully arrived at the method of determining a direction or order, not whether one could have determined a particular optimum direction or order of prediction directions. Moreover, just because there are a finite number of possible prediction directions, or orders of prediction directions, does not necessarily mean that there are a finite number of possible methods of determining an optimum prediction direction or order of prediction directions.[1] In other words, Applicants claim a method for determining the best prediction direction, and the Examiner has not shown that this claimed method is merely one of a "finite number of identified, predictable" methods.

[1] Applicants note that while there are a finite number of prediction directions, e.g., eight, there are 40,320 possible mode orders based on these eight directions (8!=40,320). Assuming, *arguendo*, that the Examiner's statement of the potential solution is correct, how would one of ordinary skill in the art have arrived at the optimum ordering of the prediction directions from 40,320 possibilities?

Claimed Invention as a Whole

As discussed in M.P.E.P. §2141, in order to meet the burden of establishing *prima facie* obviousness, the Examiner must make the underlying factual inquiries required by *Graham v. John Deere Co.*, including "ascertaining the differences between the claimed invention and the prior art." It is fundamental that this factual determination must be made based on the claims "as a whole", rather than merely reducing the claimed invention down to a concept or "gist". The M.P.E.P. provides the following guidance in this regard:

> **2141.02 Differences Between Prior Art and Claimed Invention**
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> Ascertaining the differences between the prior art and the claims at issue requires interpreting the claim language, and considering both the invention and the prior art references as a whole. See MPEP § 2111 - § 2116.01 for case law pertaining to claim interpretation.
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> **I. THE CLAIMED INVENTION AS A WHOLE MUST BE CONSIDERED**
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> In determining the differences between the prior art and the claims, the question under 35 U.S.C. 103 is not whether the differences themselves would have been obvious, but whether the claimed invention as a whole would have been obvious. *Stratoflex, Inc. v. Aeroquip Corp.*, 713 F.2d 1530, 218 USPQ 871 (Fed. Cir. 1983); *Schenck v. Nortron Corp.*, 713 F.2d 782, 218 USPQ 698 (Fed. Cir. 1983)....
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> * * *
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> **II. DISTILLING THE INVENTION DOWN TO A "GIST" OR "THRUST" OF AN INVENTION DISREGARDS "AS A WHOLE" REQUIREMENT**
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> Distilling an invention down to the "gist" or "thrust" of an invention disregards the requirement of analyzing the subject matter "as a whole." *W.L. Gore & Associates, Inc. v. Garlock, Inc.*, 721 F.2d 1540, 220 USPQ 303 (Fed. Cir. 1983), *cert. denied*, 469 U.S. 851 (1984).... See also *Jones v. Hardy*, 727 F.2d 1524, 1530, 220 USPQ 1021, 1026 (Fed. Cir. 1984) ("treating the advantage as the invention disregards statutory requirement that the invention be viewed 'as a whole'"); *Panduit Corp. v. Dennison Mfg. Co.*, 810 F.2d 1561, 1 USPQ2d 1593 (Fed. Cir.), *cert. denied*, 481 U.S. 1052 (1987) (district court improperly distilled claims down to a one word solution to a problem).

The Office Action mentions the claimed elements only to point out that they are not disclosed by the cited reference, Sun. (Office Action at pages 3-4). Therefore, it seems that the Examiner considers claim 1 in its entirety to be different than the prior art. This is actually a strong indication that claim 1 is patentable over the prior art, because there is apparently no overlap between the subject matter of claim 1 and the prior art.

Nevertheless, based on the "obvious to try" rationale discussed above, the Examiner finds claim 1 to be unpatentable, based on the assertion that "one of ordinary skill in the art at the time of the invention could have pursued the known possible mode orders with a reasonable expectation of successfully finding the optimal order for particular coding situations." (Office Action at page 4). However, this assertion has the effect of reducing claim 1 to its supposed "gist" of "finding the optimal order for particular coding situations," which is improper.

When considered as a whole, as the law requires, claim 1 recites an iterative algorithm in which particular initial directions are evaluated for a particular block. Then, based on the results of these evaluations, further particular directions are evaluated until the best direction is determined for the block in question. Why would it have been obvious to one of ordinary skill in the art to perform the particular claimed steps recited in claim 1? This is the question which must be answered by the Examiner in order to support an obviousness rejection based on the "obvious to try" rationale.

***Prima Facie* Obviousness**

As discussed above, none of the elements of claim 1 are disclosed by the cited reference, Sun, and the grounds of rejection under 35 U.S.C. §103 based on the "obvious to try" rationale are flawed for at least the reasons presented above. It is, therefore, deemed that *prima facie* obviousness has not been established with respect to claim 1.

Accordingly, claim 1 is patentable over Sun.

Claims 2-8, which depend from independent claim 1, are patentable over the applied prior art for reasons discussed above in regard to claim 1, as well as for reciting patentable subject matter in their own right.

Conclusion

Based on all of the above, the present application is now in proper condition for allowance. Prompt and favorable action to this effect and early passing of this application to issue are respectfully solicited.

It is believed that no additional fees or charges are required at this time in connection with the present application. However, if any additional fees or charges are required at this time, they may be charged to our Patent and Trademark Office Deposit Account No. 03-2412.

Respectfully submitted,
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Dated: February 7, 2011